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Part 1: Theoretical Questions

Q1

Object-Oriented Programming (OOP) is a programming paradigm that uses "objects" to represent data and methods to manipulate that data. The four main pillars of OOP are encapsulation, inheritance, polymorphism, and abstraction. These principles contribute to better software design by promoting code reusability, modularity, and easier maintenance.

Q2

A constructor in Python is a special method used to initialize objects. The `__init__` method is called automatically when a new object is created. For example, in a class `Car`, the constructor can initialize attributes like `make` and `model`:

python

```
class Car:
```

```
    def __init__(self, make, model):
```

```
        self.make = make
```

```
        self.model = model
```

Q3

Class variables are shared among all instances of a class, while instance variables are unique to each object. For example:

python

```
class Dog:
```

```
    species = "huskey" # Class variable
```

```
    def __init__(self, name):
```

```
        self.name = name # Instance variable
```

```
dog1 = Dog("Buddy")
```

```
dog2 = Dog("Max")
```

```
print(dog1.species) # huskey
```

```
print(dog1.name)    # Buddy
```

```
print(dog2.name)    # Max
```

Q4: A class method is a method that is bound to the class and not the instance of the class. It can modify class state that applies across all instances. A static method does not modify class or instance state and is defined with the `@staticmethod` decorator.
Example:

python

```
class Example:
```

```
    @classmethod
```

```
    def class_method(cls):
```

```
        return "This is a class method."
```

```
    @staticmethod
```

```
def static_method():  
    return "This is a static method."
```

Q5: A real-world scenario where class variables would be more appropriate is in a scenario where a bank has a universal interest rate applicable to all accounts. Class variables are suitable here because they maintain a single value for all instances, ensuring consistency across the accounts.